Claims

1. Materials composites of a moulded article of at least one transparent or translucent dyeable plastics moulding compound which moulded article is bonded to at least one transparent or translucent surface layer and/or to decorative films, functional films or coats or rubbers or other plastics, characterised in that said plastics moulding compound used for the manufacture of said moulded article, said surface layer or said other plastics contains in an amount of 0.01 to 5.0 % by weight, preferably 0.01 to 2.0 % by weight, each related to the total weight of the moulding compound, at least one lubricant selected from the group consisting of sorbitan esters, sebacic acid esters, dodecanedioic acid esters, docosanoic acid esters, glycerine, glycol, diethylene glycol, stearoyl amide, stearyl stearate, ethylene bissteroyl amide, octane pyrrolidone, and from the group consisting of non-polar paraffin oils and tetracosanes, and that a permanent adhesion to said other plastics layers and/or films or coats or rubbers or other plastics is achieved.

2. The materials composites according to claim 1, wherein said lubricant contains at least one hydrocarbon having a tetracosane basic structure, and low-molecular paraffins.

3. The materials composites according to claim 2, wherein said tetracosane used is a 2,6,10,15,19,23-hexamethylene tetracosane and/or isomer thereof.

4. The materials composites according to any one of claims 1 to 3, wherein said moulding compound for the manufacture of said moulded article and/or said transparent surface layers and/or said other plastics consists of polymethyl methacrylate, polycarbonate, diethylene-glycol-diallyl carbonate (CR 39), polystyrene, polyethylene terephthalate, polybutylene terephthalate, PEN, and copolymers thereof, polyamide, copolyamide, polyether sulphone, poly(aryl) ether

ketone, polyimide, polyurethane, polyacetal, polyamide imide, polyether ketone, polyether imide, polyphenylene oxide, poly(oxymethylene), acrylonitrile/butadiene/styrene polymer or mixtures thereof.

5. The materials composites according to any one of claims 1 to 4, wherein said at least one lubricant is added during the polymerisation or polycondensation of said plastics moulding compounds, is compounded as a master batch or is applied to the granulate made from said plastics moulding compounds and/or is used for the dispersion of coloured pigments.

6. The materials composites according to any one or a plurality of claims 1 to 5, wherein said transparent or translucent dyeable plastics moulding compounds for the manufacture of said moulded article and/or for the manufacture of said transparent or translucent surface layer are polyamide moulding compounds consisting of lactams, ω-amino acids and/or dicarboxylic acids including suitable amounts of diamines, the structures of the respective monomers being derived from the group of aliphatics, cycloaliphatics or aromatics which may comprise other substituents or branches.

7. The materials composites according to any one of the preceding claims 1 to 6, wherein said moulded articles can be manufactured by the injection moulding process or injection compression moulding process, injection blow moulding process, injection stretch blow moulding process or extrusion process, film-laminating process or a special injection moulding process.

8. The materials composites according to any one of the preceding claims 1 to 7, wherein they are improved by in-mould labelling, in-mould decoration, in-mould film decoration, composite injection moulding, laminating, vapour coating, printing, adhesive bonding, dyeing or coating, and sealing and are permanently bonded to other components.

9. The materials composites according to claim 8, wherein they are coated and, particularly preferably, hard coats or dyeable hard coats are attached with or without a primer-coat layer from solution onto the moulded article manufactured by thermoplastic forming processes or by forming processes for reactive casting compounds such as polyurethane casting compounds, and they are

cured.

10. The materials composites according to claim 8 or 9, wherein vapour coating processes (sputtering) are used to apply layers to these moulded articles where a silicon hard coat or a shade is produced by evaporation of metals with or without a preparation by plasma treatment.

11. The materials composites according to any one of the preceding claim 8 or 10, wherein they are used for optical components such as ophthalmic lenses or sun lenses for eyeglasses, magnifier lenses, lens systems, microscopes, cameras, displays for mobile cellular telephones, camera lenses, measuring instruments, watch-glasses or watch cases, cases for portable telephone sets with or without integrated displays or all kinds of apparatuses and for CDs, DVDs, lenses for LEDs, optical waveguides, light couplers, light amplifiers, distributors and panes for lamps and laser alignment tools, multi-layer films, compound containers and all kinds of transparent composites.

12. The materials composites according to any one of the preceding claims 8 to 10, wherein said coats applied comprise the colouring substance and/or an antireflection coating and/or a UV protection and/or photochromic and/or thermochromic and/or antifogging and/or water-repellent and/or scratch-proof functions.

13. The materials composites according to any one of the preceding claims 1 to 12, wherein said other plastics are made of transparent plastics containing lubricants and are joined or bonded to decorative films, functional films such as polarizing sheets, hard-coat films, filter films, or coats or rubbers or other plastics.

14. The materials composites according to any one of the preceding claims 1 to 13, wherein said polyamides of said moulding compounds are represented by the following chains of formula (0):

$$-(NH\text{-}R_1\text{-}CO)_x\text{-}(NH\text{-}R_2\text{-}NH)_y\text{-}(CO\text{-}R_3\text{-}CO)_y- \qquad \text{formula (0),}$$

where

x, y stand for 0 to 100 mole-% and the groups R_1, R_2, R_3 may be the same or different and consist of linearly aliphatic or branched chains having 2 - 18 (CH_2) units or of chains having cycloaliphatic nuclei, dialkyl cycloaliphatic nuclei, alkylated cycloaliphatic nuclei, ortho, meta, para aromatic nuclei, ortho, meta, para dialkyl aromatic nuclei or mixtures thereof, wherein the aromatic or cycloaliphatic nuclei may be mononuclear or polynuclear and may be bonded directly or indirectly or through linear or branched alkyl groups.

15. The materials composites according to claim 14, wherein said polyamide compositions for said polyamide moulding compounds consist of one or more components of said polyamides of formula (0) and one or more components of semicrystalline polyamides, copolyamides, or block copolyamides.

16. The materials composites according to claim 14, wherein said polyamide compositions for said polyamide moulding compounds consist of one or more components of said polyamides of formula (0) and one or more components selected from the group consisting of impact strength modifiers such as grafted sheath/core polymers, impact strength modifiers such as SBR, SBS, EPS, EPR, SEBS, EMP, EPDM, maleic anhydride, grafted polyethylenes, propylene, terpolymers of ethylene-glycidyl methacrylate, and from the group of foreign polymers or from the group of thermotropic or thermochromic additives which change the shade in dependence on temperature or independent of the wavelength of the radiated light, and other processing agents or from the group of reinforcing materials such as glass fibres or balls, or antidamping agents.

17. The materials composites according to any one of claims 14 to 16, wherein said polyamides of said moulding compounds consist of:

A. 100 mole-% of a diamine mixture of 10 - 70 mole-% of PACM [bis-(4-amino-cyclohexyl) methane] containing less than 50 % by weight of trans,trans isomers, and 90 - 30 mole-% of MACM [bis-(4-amino-3-methyl-cyclohexyl) methane], wherein 0 - 10 mole-% of the diamine mixture may be substituted by other aliphatic diamines having 6 to 12 C-atoms, cycloaliphatic, alkyl-substituted cycloaliphatic, branched aliphatic diamines or multiamines having 3 to 12 amino groups or mixtures thereof if required; and

B. 100 mole-% of long-chain aliphatic dicarboxylic acids having 8 to 14 C-atoms or mixtures of these dicarboxylic acids, wherein 0 - 100 mole-% of these dicarboxylic acids may be substituted by other aromatic or cycloaliphatic dicarboxylic acids having 8 to 16 C-atoms which are particularly selected from the group consisting of isophthalic acid, terephthalic acid, naphthaline dicarboxylic acid, cyclohexane dicarboxylic acid or mixtures thereof,
wherein 0 - 100 mole-% of the other long-chain aliphatic diamines and 0 - 100 mole-% of the other long-chain aliphatic dicarboxylic acids may optionally be added as 0 - 20 mole-% of ω-amino acids having 6 to 12 C-atoms or lactams having 6 to 12 C-atoms.

18. The materials composites according to claim 17, wherein said polyamides consist of:

A. 100 mole-% of a diamine mixture of 30 - 70 mole-% of PACM [bis-(4-amino-cyclohexyl) methane] containing less than 50 % by weight of trans,trans isomers, and 70 - 30 mole-% of MACM [bis-(4-amino-3-methyl-cyclohexyl) methane]; and

B. 100 mole-% of dodecanedioic acid (DDA) or sebacic acid (SA) or azelaic acid (AA) or mixtures thereof.

19. The materials composites according to claim 17 or 18, wherein said polyamides consist of:

A. 100 mole-% of a diamine mixture of 40 - 70 mole-% of PACM [bis-(4-amino-cyclohexyl) methane] containing less than 50 % by weight of trans,trans isomers, and 60 - 30 mole-% of MACM [bis-(4-amino-3-methyl-cyclohexyl) methane]; and

B. 100 mole-% of dodecanedioic acid.

20. The materials composites according to any one of claims 17 to 19, wherein said polyamides consist of:

A. 100 mole-% of a diamine mixture of 50 - 70 mole-% of PACM [bis-(4-amino-cyclohexyl) methane] containing less than 50 % by weight of trans,trans isomers, and 50 - 30 mole-% of MACM [bis-(4-amino-3-methyl-cyclohexyl) methane]; and

B. 100 mole-% of dodecanedioic acid.

21. The materials composites according to any one of claims 1 to 13, wherein said polyamides

of said moulding compounds are polyamides based on copolyamides which particularly have a refractive index n_D^{20} over 1.59, particularly preferably over 1.6, which have a predominant weight percentage of diamines and dicarboxylic acids having aromatic nuclei, characterised by the following chains represented by formula (A):

$$-\{IPA\text{-}NH\text{-}R_1\text{-}NH\}_{n1}\text{-}\{TPA\text{-}NH\text{-}R_2\text{-}NH\}_{n2}\text{-}\{CO\text{-}R_3\text{-}NH)_{n3}\text{-} \quad (A),$$

where

$n_1 = 40$ to 100 % by weight,

$n_2 = 60$ to 0 % by weight,

$n_3 = 0$ to 30 % by weight and wherein the weight percentages of n_1, n_2 and n_3 balance to 100 % by weight,

wherein the diamines having the nuclei R_1, R_2 may be the same or different and consist of para-xylylene or meta-xylylene units in an amount of at least 30 mole-% related to 100 mole-% of diamine and consist of linearly aliphatic or branched chains having 2 to 12 (CH_2) units or of chains having cycloaliphatic nuclei which are used alone or as mixtures and wherein 100 mole-% of said dicarboxylic acids consist of at least 40 mole-% of isophthalic acid (IPA) and of terephthalic acid (TPA) in an amount to balance 100 mole-%, wherein TPA may completely or partially be substituted by naphthaline dicarboxylic acids , wherein up to 30 % by weight of said copolyamides of said moulding compounds may be substituted by amino acids or lactams having an R_3 nucleus, consisting of 5 to 11 (CH_2) chains .

22. The materials composites according to claim 21, wherein said copolyamides comprise the composition of formula (B):

MXDI/MXDT/6I/6T (B),

where

the respective components have the following mole percentages:

meta-xylylene diamine (MXD): 20 to 100 mole-%,

hexamethylene diamine (6): 80 to 0 mole-%,

isophthalic acid (I): 50 to 100 mole-%, and
terephthalic acid (T): 50 to 100 mole-%,
each related to 100 mole-% of diamine and 100 mole-% of dicarboxylic acids, wherein meta-xylylene diamine may completely or partially be substituted by para-xylylene diamine and wherein terephthalic acid may completely or partially be substituted by naphthaline dicarboxylic acid, wherein symmetric or preferably asymmetric isomers or mixtures thereof may be used.

23. The materials composites according to claim 22, wherein said copolyamides comprise the composition of formula (B):

MXDI/MXDT/6I/6T (B),

where
the respective components have the following mole percentages:
meta-xylylene diamine (MXD): 20 to 80 mole-%,
hexamethylene diamine (6): 80 to 20 mole-%,
isophthalic acid (I): 60 to 80 mole-%, and
terephthalic acid (T): 40 to 20 mole-%,
each related to 100 mole-% of diamine and 100 mole-% of dicarboxylic acids.

24. The materials composites according to claim 22, wherein said copolyamides comprise the composition of formula (C):

6I/6T/6NDC (C),

where
the respective components have the following mole percentages:
naphthaline dicarboxylic acid (NDC) having a symmetric or asymmetric substituent position, or mixtures thereof, particularly 2,6-naphthaline carboxylic acid: 20 to 80 mole-%,
isophthalic acid (I): 80 to 20 mole-%,
terephthalic acid (T): 40 to 0 mole-%, and

hexamethylene diamine (6): 100 mole-%, which hexamethylene diamine may completely or partially be substituted by ethylene diamine, trimethyl hexamethylene diamine, or linear diamines having 8 to 12 CH_2-groups, or cycloaliphatic diamines such as norbornane diamine, 4,4`-diaminodicyclohexyl methane, 3,3`-dimethyl-4,4`-diaminodicyclohexyl methane or mixtures thereof, each related to 100 mole-% of diamine and 100 mole-% of dicarboxylic acids.

25. The materials composites according to any one of claims 1 to 13, wherein said polyamides of said polyamide moulding compounds are polyamidblends consisting of

a polyamide having the composition of formula (I); and

at least one semicrystalline polyamide having the composition of formula (II), wherein the components of said polyamide (I) and said polyamide (II) are used in a ratio of 99 : 1 to 1 : 99, preferably 10 : 90 to 90 : 10, so that the sum equals 100 parts, wherein said polyamide (I) has the following monomer composition or is represented by chains of the following formulas (Ia) or (Ib):

$$\{(\text{-OOC-X-COO})_a(\text{HN-Y-NH})_a(\text{OOC-Z-NH})_b\}_c \quad \text{(Ia)},$$

$$\{(\text{-OOC-X}_1\text{-COO})_{a1}(\text{HN-Y}_1\text{-NH})_{a1}(\text{OOC-Z}_1\text{-NH})_{b1}]_{c1} \quad \text{(Ib)},$$

where

X = iso-phenylene, para-phenylene,4 - 12 (CH_2) units, cyclohexyl, naphthyl, norbornyl, norbornane dimethyl, trimethyl hexamethylene,

X_1 = iso-phenylene, para-phenylene2 - 12 (CH_2) units, cyclohexyl, naphthyl, norbornyl, norbornane dimethyl, trimethyl hexamethylene,

Y = (CH_2): 2 - 12 (CH_2) units, cyclohexyl, bis-(methyl-cyclohexyl) methane, bis-(methyl-cyclohexyl) ethane, bis-(methyl-cyclohexyl) propane, norbornyl, norbornane dimethyl, trimethyl hexamethylene, bis-(cyclohexyl) methane, bis-(cyclohexyl) ethane, bis-(cyclohexyl) propane,

Y_1 = (CH_2): 2 - 12 (CH_2) units, cyclohexyl, bis-(methyl-cyclohexyl) methane, bis-(methyl-cyclohexyl) ethane, bis-(methyl-cyclohexyl) propane, norbornyl, norbornane dimethyl,

trimethyl hexamethylene, bis-(cyclohexyl) methane, bis-(cyclohexyl) ethane, bis-(cyclohexyl) propane,

Z = (CH_2): 4 - 12 (CH_2) units, cyclohexyl, bis-(methyl-cyclohexyl) methane, bis-(methyl-cyclohexyl) ethane, bis-(methyl-cyclohexyl) propane, norbornyl, norbornyl dimethyl,

Z_1 = (CH_2): 4 - 12 (CH_2) units, cyclohexyl, bis-(methyl-cyclohexyl) methane, bis-(methyl-cyclohexyl) ethane, bis-(methyl-cyclohexyl) propane, norbornyl, norbornyl dimethyl, trimethyl hexamethylene, and

a = 0 - 50 mole-%, b = 0 - 100 mole-%, a_1 = 0 - 50 mole-%, b_1 = 0 - 100 mole-%, and

the sum of $a + a_1 + b + b_1$ is 100 mole-% and the sum of $c + c_1$ is 100 % by weight; and wherein said semicrystalline polyamide (II) is represented by chains of formula (IIa) and/or (IIb):

$$[(\text{-HN-u-COO-})_d(\text{-HN-v-COO-})_e(\text{-HN-s-NH-})_f(\text{-OOC-t-COO-})_f]_g \quad \text{(IIa)},$$

$$[(\text{-HN-s}_1\text{-NH-})_{f1}(\text{-OOC-t}_1\text{-COO-})_{f1}]_{g1} \quad \text{(IIb)},$$

where

u = (CH_2): 4 - 12 (CH_2) units, v = (CH_2): 4 - 12 (CH_2) units,

s, s_1 = (CH_2): 2 - 12 (CH_2) units, meta-xylylene, para-xylylene,

t, t_1 = (CH_2): 2 - 12 (CH_2) units, iso-phenylene, para-phenylene, and

f = 0 - 50 mole-%, d = 0 - 100 mole-%,

f_1 = 0 - 50 mole-%, e = 0 - 100 mole-%,

wherein the sum of $f + f_1 + d + e$ is 100 mole-% and

the sum of $g + g_1$ is 100 % by weight; and

at least 0.01 to 2.0 parts by weight of a phosphorus compound of formula (III), related to 100 parts by weight of said polyamides of formulas (Ia)/(Ib), (IIa)/(IIb), which may be used in a pure form or as an aqueous solution:

$$[X\,(R`)_nP(O)_l(OR``)_m] \quad \text{(III)},$$

where

X = H, -OR``, 2-pyridyl, $-NH_2$, -NHR`, -NR`R``, wherein X may be bonded to (R`) or may be directly bonded to P,

R`= $(CH_2)_{n1}$, linear or branched,

R`` = Li, Na, K, H, $(CH_2)_{n2}$, linear or branched, and

n = integer of 0 to 5; l = 0, 1, 1.5, 2, 2.5; m = integer of 0 to 3; n_1 = integer of 1 to 12, n_2 = 1 to 12; and/or

0.01 to 15 parts by weight of cyclic phosphonic acid anhydride compounds of formula (IV), related to 100 parts by weight of said polyamides of formulas (Ia)/(Ib), (IIa)/(IIb), which may be used in a pure form or as an aqueous solution:

$$[-(R)PO(O)-]_n \qquad \text{(IV)},$$

where

n = 3, 4, 5, 6, an alternating -P-O- heterocycle having 3, 4, 5, 6 (P-O) units in the ring,

R = CH_3, C_2H_5, C_3H_7, C_4H_9, isobutyl, 2,2,6,6-tetramethyl-4-piperidyl.

26. The materials composites according to claim 25, containing 10 to 90 % by weight of a polyamide (I) and 90 to 10 % by weight of a semicrystalline polyamide (II).